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DEFENSE MAPPING AGENCY
BUILDING 56 U.S. NAVAL OBSERVATORY
WASHINGTON D.C. 20305

U-2548/CMP

5 FEB 1985

SUBJECT: FY 1986 RDT&E Descriptive Summaries Guidance

TO: Administrator
Defense Technical Information Center
ATTN: DTIC-DD
Cameron Station
Alexandria, Virginia 22314

1. Reference Director for Research & Development memorandum of 14 November 1984, subject as above.
2. In accordance with guidance in referenced memorandum, the unclassified version of the FY 1986 RDT&E Descriptive Summaries for the Defense Mapping Agency is enclosed.

FOR THE DIRECTOR:

Jan 1985

Enclosure a/s

John R. Vaughan
JOHN R. VAUGHAN
Comptroller

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Research, Development, Test and Evaluation, Defense Agencies

Descriptive Summaries for Program Elements

Defense Mapping Agency

FY 1986

January 1985

Distribution limited to U.S. Government agencies and their contractors: Administrative/Operational Use, 6 February 1985. Other requests for this document shall be referred to Mr. Charles Leslie, Deputy Comptroller, Defense Mapping Agency, Building 56, U.S. Naval Observatory, Washington, DC 20305-3000.

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PROGRAM ELEMENT DESCRIPTIVE SUMMARIES

INTRODUCTION AND EXPLANATION OF CONTENTS

1. (U) General. This document has been prepared to provide information on the Defense Mapping Agency (DMA) Research, Development, Test and Evaluation (RDT&E) Program to Congressional committees during the FY 1985 hearings. The Descriptive Summaries provide narrative information on all RDT&E program elements and projects.

2. (U) Comparison of FY 1985 and FY 1986 Data. A direct comparison of FY 1985 and FY 1986 data in the Program Element Descriptive Summaries dated January 1984 will reveal significant differences. The differences are attributable to the following factors: (1)

a. (U) FY 1985 reductions of \$5.316 million are the result Congressional reductions, and (2)

b. (U) FY 1986 reduction of \$1.473 million reflects a realignment of resources into the Procurement appropriation to support Exploitation Modernization Program (EMP) requirements.

3. (U) Relationship of FY 1986 Budget Structure to the FY 1985 Budget Approved by Congress. DMA has no changes to the budget structure in FY 1986.

4. (U) Classification. Classified information is identified by the use of brackets []

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Classification	<i>Secret</i>
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Availability Codes	
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DEFENSE MAPPING AGENCY RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES SUMMARY BY PROGRAM CATEGORY (\$ in Thousands)

	<u>FY 1984 Actual</u>	<u>FY 1985 Estimate</u>	<u>FY 1986 Estimate</u>	<u>FY 1987 Estimate</u>
6.1 (U) Research	--	--	--	--
6.2 (U) Exploratory Development	--	695	975	1,954
6.3 (U) Advanced Development	13,575	16,779	28,197	15,767
6.4 (U) Engineering Development	7,628	5,981	3,892	2,365
6.5 (U) Management and Support	--	--	--	--
(U) Total Research & Development (Program 6)	21,203	23,455	24,264	20,086
(U) Total Operational Systems Program	--	--	--	--
(U) Total Intelligence & Communications (Program 3)	108,939	178,673	252,603	213,780
(U) Total RDT&E - Direct	130,142	202,120	276,867	233,786
(U) Reimbursements	1,472	2,000	2,000	2,000
(U) TOTAL PROGRAM	131,614	204,120	278,867	235,786

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DEFENSE MAPPING AGENCY
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES
DETAILS BY BUDGET ACTIVITY
(\$ in Thousands)

			<u>FY 1984</u> <u>Actual</u>	<u>FY 1985</u> <u>Estimate</u>	<u>FY 1986</u> <u>Estimate</u>	<u>FY 1987</u> <u>Estimate</u>
5.	(U) <u>Intelligence & Communications</u>					
(U)	<u>Element Code</u>	<u>Title</u>				
(U)	3.5	<u>ACTIVITIES (OTHER)</u>				
✓(v)	3.51.39.B	<u>Exploitation Modernization Program (EMP)</u>	--	167,385	242,853	
(v)		Subtotal, EMP	--	167,385	242,853	
✓(v)	3.51.59.B	<u>Defense Reconnaissance Support Activities</u>				
		<u>(DRSA)</u>	188,939	11,288	9,758	
(v)		Subtotal, DRSA	188,939	11,288	9,758	
(U)	6.2	<u>EXPLORATORY DEVELOPMENT</u>				
✓(U)	6.27.16.B	<u>Mapping, Charting, and Geodesy (MC&G)</u>	--	695	975	1,954
(U)		Subtotal, Exploratory Development	--	695	975	1,954
(U)	6.3	<u>ADVANCED DEVELOPMENT</u>				
(U)	6.37.01.B	<u>MC&G Investigations and Prototype</u>				
		<u>Development</u>	13,575	16,779	28,197	15,767
(U)		Subtotal, Advanced Development	13,575	16,779	28,197	15,767
(U)	6.4	<u>ENGINEERING DEVELOPMENT</u>				
(U)	6.47.01.B	<u>MC&G Development Engineering and Tests</u>	7,628	5,981	3,892	2,365
		Subtotal, Engineering Development	7,628	5,981	3,892	2,365
		TOTAL, INTELLIGENCE & COMMUNICATIONS	138,142	282,128	276,867	233,786

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DEFENSE MAPPING AGENCY RESEARCH, DEVELOPMENT, TEST AND EVALUATION, DEFENSE AGENCIES SUMMARY BY BUDGET ACTIVITY (\$ in Thousands)

	<u>FY 1984</u> <u>Actual</u>	<u>FY 1985</u> <u>Estimate</u>	<u>FY 1986</u> <u>Estimate</u>	<u>FY 1987</u> <u>Estimate</u>
1. (U) Technology Base	--	--	--	--
2. (U) Advanced Technology Development	--	--	--	--
3. (U) Strategic Programs	--	--	--	--
4. (U) Tactical Programs	--	--	--	--
5. (U) Intelligence & Communications	130,142	202,128	276,867	233,786
6. (U) Defensewide Mission Support	--	--	--	--
(U) TOTAL RDT&E - DIRECT	130,142	202,128	276,867	233,786
(U) Reimbursements	<u>1,472</u>	<u>2,000</u>	<u>2,000</u>	<u>2,000</u>
(U) TOTAL PROGRAM	131,614	204,128	278,867	235,786

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FY 1986 RDT&E DESCRIPTIVE SUMMARY

(U) Program Element: #627168
 (U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Title: Mapping, Charting and Geodesy (MC&G)
 (U) Budget Activity: Intelligence & Communications #5

A. (U) RESOURCES: (\$ in Thousands)

Project Number	Title	FY 1984 Actual	FY 1985 Estimate	FY 1986 Estimate	FY 1987 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	--	695	975	1,954	Continuing	N/A
(U) 6.2E	MC&G Exploratory Research	--	695	975	1,954	Continuing	N/A

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The primary mission of the Defense Mapping Agency is to support the Unified and Specified Commands and the Military Services by providing mapping, charting and geodesy (MC&G) products and services that are critical to successful military operations. The DMA Research, Development, Test and Evaluation (RDT&E) Program is designed to continuously increase the capabilities of the DMA Production Centers so that they may rapidly and effectively satisfy the current and projected DoD MC&G requirements. Accordingly, this program element will provide DMA with an on-going RDT&E exploratory development program to meet increasing DoD MC&G technology needs. This program element also gives DMA the required capability to influence and augment the Military Services, private industry, and other scientific groups' exploratory research and to drive those technology base activities which address unique needs critical to future DMA digital production systems being developed by the DMA Special Program Office for Exploitation Modernization and to future geodetic/geophysical and hydrographic programs.

C. (U) COMPARISON WITH FY 1985 DESCRIPTIVE SUMMARY: The total amount for the FY 1986 program, as shown above, is \$77 thousand less than the FY 1986 column of the FY 1985 Descriptive Summary. The reduction represents a relatively minor refinement in planned program activities for FY 1986.

D. (U) OTHER APPROPRIATION FUNDS: N/A

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(U) Program Element: #627168

(U) USDR&E Mission Area: Geophysical and Space
Support #J25 - TITARA

(U) Title: Mapping, Charting and Geodesy (MC&G)

(U) Budget Activity: Intelligence & Communications #5

E. (U) RELATED ACTIVITIES: Defense Research Sciences Exploratory Development programs are conducted by the Army, Navy and Air Force laboratories to support continuing evolutionary development of equipment and techniques. The Director, Defense Mapping Agency, as Program Manager for DoD Mapping, Charting and Geodesy, maintains cognizance of these programs to assure that efforts are directed toward valid capability development objectives and to preclude unwarranted duplication.

F. (U) WORK PERFORMED BY: In addition to the related activities described in paragraph E., DMA will use private commercial contractors, including the academic community, to perform the required exploratory research. Initially, the research will be performed by six universities that are national leaders in the fields of image analysis and/or data base management. They are, Carnegie-Mellon University, University of Massachusetts, University of Maryland, Washington University, Louisiana State University, and University of Southern California.

G. (U) PROJECTS LESS THAN \$7 MILLION IN FY 1986:

1. (U) 6.2E - MC&G Exploratory Research: Contracts are being let to six universities to begin exploratory research in Automated Feature Analysis and Large Scale Data Base Development.

2. (U) Program Accomplishments and Future Programs:

a. (U) FY 1984 Accomplishments: N/A. Program was initiated in FY 1985.

b. (U) FY 1985 Program:

(1) (U) Automated Feature Analysis: Develop techniques and algorithms which will reduce feature analysis production times by at least an order of magnitude (one-tenth).

(2) (U) Large Scale Data Base Development/Management: Develop techniques, algorithms, and data structures which will support the massive data base requirements of the post-1990 digital production systems.

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EXHIBIT PB-338
(continued)

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(U) Program Element: #627168

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Title: Mapping, Charting and Geodesy (MC&G)

(U) Budget Activity: Intelligence & Communications #5

c. (U) FY 1986 Planned Program and Basis for FY 1986 Request: The FY 1986 program will be a continuation of the FY 1985 contracts with the universities. The request for bids asked each of the universities to submit costs for each year of a three-year program. DMA has review authority at the end of each year and the option to continue, redirect, or cancel any particular exploratory development effort. It is anticipated to expand the most productive efforts and cancel any which appear unproductive.

d. (U) Program to Completion: This is a continuing exploratory research program element.

e. (U) Milestones: N/A

H. (U) PROJECTS OVER \$7 MILLION IN FY 1986: N/A

I. (U) TEST AND EVALUATION DATA: N/A

EXHIBIT PB-338
(continued)

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FY 1986 RDT&E DESCRIPTIVE SUMMARY

(U) Program Element: #63701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

Budget Activity: Intelligence & Communications #5

A. (U) RESOURCES: (\$ in Thousands)

Project Number	Title	FY 1984 Actual	FY 1985 Estimate	FY 1986 Estimate	FY 1987 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	13,575	16,779	20,197	15,767	Continuing	N/A
(U) 6.3S	MC&G Data Collection & Analysis	6,932	9,935	9,441	8,464		
(U) 6.3D	MC&G Data Processing & Management	3,483	2,549	7,000	4,270		
(U) 6.3P	MC&G Product Generation	3,160	4,295	3,756	3,025		

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The primary mission of the Defense Mapping Agency (DMA) is to support the Unified and Specified Commands and the Military Services by providing mapping, charting, and geodesy (MC&G) products and services that are critical to successful military operations. The DMA Research, Development, Test and Evaluation (RDT&E) program is designed to continuously increase the capabilities of the DMA Production Centers so that they may rapidly and effectively satisfy the current and projected DoD MC&G requirements. Specifically, this program provides the broad based RDT&E investigations and prototype developments necessary to meet MC&G requirements. This program will achieve its objectives by (1) continuing RDT&E support in problem areas using DMA's existing analog/hardcopy production system, (2) continuing with those developments required to more fully automate the MC&G data extraction process and the development of optimum spatial data bases, (3) continuing with on-going geophysical/gravity and hydrographic developments in satisfying current DoD requirements, and (4) continuing with developments of new capabilities to produce new MC&G products.

C. (U) COMPARISON WITH FY 1985 DESCRIPTIVE SUMMARY: The total amount for the FY 1986 program, as shown above, is \$5.4 million greater than the FY 1986 column of the FY 1985 Descriptive Summary. Program evaluations indicated that some early returns on RDT&E investments will be realized from increased funding of

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EXHIBIT PB-338

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(U) Program Element: 163701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development
Budget Activity: Intelligence & Communications #5

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

several Advanced Development (PE 63701B) efforts rather than Engineering Development (PE 64701B) efforts. Accordingly, the increase is the net result of internal reprogramming of funds between the two program elements.

D. (U) OTHER APPROPRIATION FUNDS: N/A

E. (U) RELATED ACTIVITIES: Defense Research and Development Programs are conducted by the Army, Navy, and Air Force laboratories to support continuing evolutionary development of equipment and techniques. The Director, Defense Mapping Agency, as Program Manager for DoD Mapping, Charting and Geodesy, maintains cognizance of these programs to assure that efforts are directed toward valid capability development objectives and to preclude unwarranted duplication.

F. (U) WORK PERFORMED BY: The major efforts are performed by the following organizations: U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Virginia; Naval Ocean Research and Development Activity, Bay St. Louis, Mississippi; U.S. Air Force Rome Air Development Center, Griffiss Air Force Base, Rome, New York; Air Force Geophysics Laboratory, Hanscom Air Force Base, Massachusetts; Naval Surface Weapons Center, Dahlgren, Virginia; Naval Sea Systems Command, Washington, D.C.; Defense Advanced Research Projects Agency, Arlington, Virginia; and Aerospace Corporation, Los Angeles, California.

G. (U) PROJECTS LESS THAN \$7 MILLION IN FY 1986:

1. (U) Program Description -- 6.3P - MC&G Product Generations: This project is designed to enhance DMA's product generation capabilities, specifically in the production areas of automated/digital cartography, graphic arts, radar reference scene generation, image simulation systems, and remote sensing techniques for the production of terrain analysis data bases and map and chart revisions and updates.

EXHIBIT PB-33B
(continued)

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(U) Program Element: #63701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

Budget Activity: Intelligence & Communications #5

2. (U) Program Accomplishments and Future Programs:

a. (U) FY 1984 Accomplishments:

(1) (U) The delivery of improved software packages to support digital elevation data production activities, to enhance plotting capabilities, and to more efficiently coordinate components of DMA's cartographic production processes.

(2) (U) Additional developments in providing DMA with a digital pre-press system, a digital color proofer, a digital printer, and a large format film writer.

(3) (U) A demonstration of the feasibility of using opposite side Synthetic Aperture Radar (SAR) to generate stereo images that can be fused by the human visual system.

(4) (U) The development of an Infra-Red (IR) model to generate simulations in support of advanced weapons systems.

(5) (U) The development of an Image Browse System (IBS) which will permit cartographers to view image quality and related features on a computer display, and in turn, the imagery will be digitized and stored on a compact storage medium (video disc).

b. (U) FY 1985 Program: The FY 1985 Program is a continuation of further investigations and prototype developments related to the program activities discussed above under the FY 1984 Accomplishments. Additional improved production techniques and software deliveries will be made in the automated/digital cartography area, further improving the overall efficiency of the cartographic production processes. Developments and evaluation of computer algorithms and programs to exploit multi-spectral data from LANDSAT will continue. In addition, DMA will participate in the evaluation of data from NASA's Shuttle Imaging Radar (SIR-B) for possible MC&G production applications. A Sensor Image Simulation (SIS) upgrade effort will be initiated this year. The SIS, at each DMA Production Center, is used for proofing and editing digital feature extraction and terrain analysis data that are used to produce the reference scenes and fire control data in DoD advanced weapons systems.

EXHIBIT PB-338
(continued)

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(U) Program Element: #637018

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

Budget Activity: Intelligence & Communications #5

c. (U) FY 1986 Planned Program and Basis for FY 1986 Request: Since this is an on-going project, the FY 1985 program activities will be continued into FY 1986. Research efforts will be initiated to develop knowledge based expert systems for decision support in software exploitation of digital cartographic data. Developments leading to the fabrication of the digital graphic arts systems and equipment listed above (paragraphs 1 and 2) will continue. Also, there will be a continuation of developments and evaluations related to Synthetic Aperture Radar (SAR) stereo fusion, advanced visual simulation techniques, processing techniques using LANDSAT and other multi-spectral data for MC&G products. The Sensor Image Simulation (SIS) upgrade will be completed this year.

d. (U) Program to Completion: N/A. This is a continuing advanced development RDT&E program.

e. (U) Milestones: N/A.

H. (U) PROJECTS MORE THAN \$7 MILLION IN FY 1986:

A1. (U) 6.3S - MC&G Data Collection & Analysis

a. (U) Project Description. This project includes continuing advanced RDT&E developments in the areas of Geodesy, Geophysics, Hydrography and related collection and analysis activities. Hardware and software techniques will be developed to exploit and collect geodetic and geophysical data used to enhance the capabilities of current and future DoD weapons systems. Specifically, DMA is required to collect MC&G data using advanced sensors and satellite technology; produce launch and target positions, including astro-geodetic deflection of the vertical; produce navigation checkpoints; and provide precise measurements of the earth's gravitational field and other geodetic and geophysical data. In the area of hydrography, developments will be directed towards satisfying DoD and statutory requirements associated with safety of navigation at sea and hydrographic charting. This will be accomplished through improved hydrographic data collection and processing related to coastal bathymetry, detection of navigation hazards, sonar surveying and remote sensing techniques.

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EXHIBIT PB-33B
(continued)

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(U) Program Element: 1637018

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDR&E Mission Area: Geophysical and Space
Support 1325 - TIARA

Budget Activity: Intelligence & Communications #5

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1984 Accomplishments:

(1) (U) Additional developments for a Gravity Gradiometer Survey System (GGSS) were achieved. A successful hardware critical design review was conducted and fabrication of the gradiometer initiated.

(2) (U) Extensive testing of the first production units of the geodetic Global Positioning Satellite (GPS) receivers was carried out with all problem areas being resolved. Significant progress was made with the navigation software and the operational time of the receivers was increased.

(3) (U) Development continued on the software necessary to process GEOSAT altimetry data.

(4) (U) Successful flight tests of the Hydrographic Airborne Laser Sounder (HALS) and Airborne Electromagnetic (AEM) bathymetric system were conducted; a successful afloat test of the Collision Avoidance Sonar (CAS) was made; Multispectral Active/Passive Scanner (MAPS) bathymetric system scanner design was completed; and successful test of several modules of the Hydrographic Information Handling (HIHAN) system was also conducted.

b. (U) FY 1985 Program: During FY 1985, developments will continue for each of the tasks discussed above in the FY 1984 program:

(1) (U) Delivery of the final production configuration of the Global Positioning Satellite (GPS) geodetic receivers will occur during this year. Acceptance, verification and operational tests will be completed early in the year, with the first units field deployed later in the year.

(2) (U) The fabrication of the major components of Gravity Gradiometer Survey System (GGSS) will be completed and integrated into the land vehicle. Static calibration will begin.

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EXHIBIT PB-33B
(continued)

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(U) Program Element: 863701B

(U) Title: Mapping, Charting and Geodisy (MC&G)
Investigations and Prototype
Development

(U) USDR&E Mission Area: Geophysical And Space
Support 8325 - TIARA

Budget Activity: Intelligence & Communications 15

(3) (U) Support to the processing of the GEOSAT altimeter data will continue with the launch of the satellite scheduled for the second quarter of FY 1985.

(4) (U) Development contract awards will be made for Airborne Electromagnetic (AEM) and Hydrographic Airborne Laser Sounder (HALS). Fifty percent of the Hydrographic Information Handling (HIHAN) modules will be completed, and integration testing of the Collision Avoidance Sonar (CAS) will be completed.

c. (U) FY 1986 Planned Program and Basis for FY 1986 Request:

(1) (U) Continued development of the GUSS will be a major effort in FY 1986. Testing in the land vehicle will be conducted followed by integration of the system into a fixed wing aircraft to be completed by FY 1987.

(2) (U) Development of a production model of the astronomic positioning instrument will proceed based on successful demonstration of the prototype unit.

(3) (U) GEOSAT data processing support will be completed. Analysis and evaluation activities will be initiated to support MC&G applications.

(4) (U) The HALS task will enter its technical evaluation phase; AEM development contract will be awarded; CAS will be installed in survey launches, and integration of GPS will begin; MAPS development will continue; and additional testing of HIHAN modules will be completed.

d. (U) Program to Completion. N/A. This is a continuing advanced development RDT&E program.

e. (U) Milestones. N/A. Many program developmental tasks are involved, as discussed above, with no overall single system development or milestone schedules for the project.

f. (U) Explanation of Milestone Changes. N/A.

EXHIBIT PB-33B
(continued)

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(U) Program Element: #63761B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDR&S Mission Area: Geophysical and Space
Support #325 - TIAPA

Budget Activity: Intelligence & Communications #5

B1. (U) 6.3D - MC&G Data Processing & Management

a. (U) Project Description. Efforts for this project will be concentrated in the areas of Data Extraction, Data Base Management, and Computer Science. In the Data Extraction and Data Base Management areas, efforts are designed to further increase automation in our MC&G production system by the use of expert systems for feature identification and extraction and for management of spatial data bases which are three-dimensional representations of the earth's surface, including the ocean bottom. MC&G user requirements have made it necessary for DMA to develop these new methods which will permit the use of more efficient automated techniques for extracting, structuring, storing and retrieving a high volume of source data required in current and emerging digital production systems. In the computer science area, developments will include the establishment of a modern programming environment within DMA, integrated simulations of production subsystems, and application of telecommunication technology and related computer engineering techniques. These efforts are designed to eliminate excessive manual data handling, inefficient software developments and maintenance difficulties and to incorporate modern software engineering methodology into the DMA production environment.

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1984 Accomplishments: Significant accomplishments during FY 1984 were:

(1) (U) Additional developments in assessing feature extraction processes in softcopy/digital domain and the various algorithms that support the softcopy extraction.

(2) (U) Additional development of basic tools and integration of emerging technology to support the complex automated feature extraction/analysis control structures on DMA's Remote Work Processing Facilities (RWPF). The RWPF's, which are located at each of DMA's two major Production Centers, are designed to provide a test-bed environment for emerging digital production scenarios.

(3) (U) Completion of the production test and evaluation on the Clustered Cartographic Processing System (CPS) for processing and editing Digital Feature Analysis Data (DFAD).

EXHIBIT PB-33B
(continued)

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(U) Program Element: #63701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDP/E Mission Area: Geophysical and Space
Support #325 - TIAPA

Budget Activity: Intelligence & Communications #5

(4) (U) Initiated the development of a DMA Computer Network Model which will establish a capability to analytically model and simulate distributed systems to allow performance management of DMA's networking environment.

(5) (U) Initiated an effort to develop an Automated Measurement System (AMS) to assist in measuring/specifying software quality throughout the entire software life cycle. As a result of this effort, a software tool will be developed that produces software measurement and analysis reports.

b. (U) The FY 1985 Program:

(1) (U) Assessing the latest feature extraction analysis and data management technology for MC&G digital production applications will continue, including the assessment of expert systems for MC&G representation and control and knowledge engineering/knowledge base technology.

(2) (U) Development of basic tools and the integration of emerging technology on the Remote Work Processing Facilities (RWPF) will also continue.

(3) (U) The development of the DMA Computer Network Model will continue as well as the Automated Measurement System development to assist in measuring/specifying software quality.

(4) (U) In participation with NASA, CIA, NSA and RADC, a cooperative program to develop an erasable optical disk will be initiated during the year. The program involves the development of material test samples, formulating media specifications, measuring disk performance parameters, developing a model and performing extensive system tests.

c. (U) FY 1986 Planned Program and Basis for FY 1986 Requests: The FY 1985 Program will continue into FY 1986. Data Extraction/Data Base developments will be concentrated on hardware and software technologies in the image processing and hardware architecture domains which could have direct applications for DMA's emerging digital production system. The RWPF will increasingly become the test-bed for the evaluation of these technologies. The development of the DMA Computer Network Model and the Automated Measurement System will be completed during this year. The optical disk buffer program will continue with sample disk

EXHIBIT PB-33B
(continued)

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(U) Program Element: #63701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Investigations and Prototype
Development

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

Budget Activity: Intelligence & Communications #5

production and system development. The FY 1986 program is essential to DMA's increasing efforts to more fully automate MC&G production processes, including automated enhancements for the emerging digital production system.

d. (U) Program to Completion: N/A. This is a continuing program.

e. (U) Milestones: N/A. Many program developmental tasks are involved, as discussed above, with no overall single system development or milestone schedule for the project.

f. (U) Explanation of Milestone Changes: N/A.

I. TEST AND EVALUATION DATA: N/A.

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EXHIBIT PB-338
(continued)

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FY 1986 RDT&E DESCRIPTIVE SUMMARY

(U) Program Element: #64701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Engineering Development and Test

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

A. (U) RESOURCES: (\$ in Thousands)

Project Number	Title	FY 1984 Actual	FY 1985 Estimate	FY 1986 Estimate	FY 1987 Estimate	Additional to Completion	Total Estimated Cost
(U) 6.4S	TOTAL FOR PROGRAM ELEMENT	7,628	5,981	3,892	2,365	Continuing	N/A
(U) 6.4S	MC&G Data Collection & Analysis	591	680	398	328		
(U) 6.4D	MC&G Data Processing & Management	4,742	4,180	1,694	1,236		
(U) 6.4P	MC&G Product Generation	2,295	1,201	1,000	801		

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The primary mission of the Defense Mapping Agency (DMA) is to support the Unified and Specified Commands and Military Services by providing mapping, charting, and geodesy (MC&G) products and services that are critical to successful military operations. The DMA Research, Development, Test and Evaluation (RDT&E) program is designed to continuously increase the capabilities of the DMA Production Centers so that they may rapidly and effectively satisfy the current and projected DoD MC&G requirements. This program provides the necessary follow-on engineering development and test of systems and equipment originating in Program Element (PE) #63701B, Mapping, Charting, and Geodesy (MC&G) Investigations and Prototype Development. Accordingly, the project titles, descriptions and objectives are the same for both program elements. This program is designed to provide a production test and evaluation environment for selected prototype equipment and production systems/subsystems. Emphasis will be placed on test and evaluation of digital techniques/algorithms and production models and processes in support of DMA's emerging digital production system, including the testing of expert systems and new technology required to more fully automate and enhance the system.

UNCLASSIFIED

EXHIBIT PB-33B

UNCLASSIFIED

(U) Program Element: 64701B

(U) Title: Mapping, Charting and Geodesy (MC&G)

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

C. (U) COMPARISON WITH FY 1985 DESCRIPTIVE SUMMARY: The total amount for the 1986 program, as shown above, is \$5.5 million less than the FY 1986 column of the FY 1985 Descriptive Summary. Program evaluations indicated that some early returns will be realized from increased funding of several Advanced Development (PE 63701B) projects rather than Engineering Development (PE 64701B) projects. Accordingly, the decrease is the net result of internal reprogramming of funds between the two program elements.

D. (U) OTHER APPROPRIATION FUNDS: N/A.

E. (U) RELATED ACTIVITIES: Defense Research Sciences Exploratory Development programs are conducted by the Army, Navy and Air Force laboratories to support continuing evolutionary development of equipment and techniques. The Director, Defense Mapping Agency (DMA), as Program Manager for DoD Mapping, Charting and Geodesy, maintains cognizance of these programs to assure that efforts are directed toward valid capability development objectives and to preclude unwarranted duplication.

F. (U) WORK PERFORMED BY: U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Virginia; Naval Ocean Research and Development Activity, Bay St. Louis, Mississippi; U.S. Air Force Rome Air Development Center, Griffiss Air Force Base, Rome, New York; Air Force Geophysics Laboratory, Hanscom Air Force Base, Massachusetts; Naval Surface Weapons Center, Dahlgren, Virginia; Naval Sea Systems Command, Washington, D.C.

G. (U) PROJECTS LESS THAN \$7 MILLION IN FY 1986:

A1. (U) Program Description -- 6.4S - MC&G Data Collection & Analysis:

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1984 Accomplishments:

(1) (U) Major verification efforts were completed to validate the earth and gravity models of the World Geodetic System (WGS) 1984.

EXHIBIT PB-33B
(continued)

UNCLASSIFIED

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(U) Program Element: #64781B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Engineering Development and Test

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

(2) (U) Additional software developments were achieved and modified equipment was delivered to provide field survey hardware and software capable of determining deflections of the vertical and other geodetic parameters in support of strategic missile programs.

(3) (U) The development of a coastal optics atlas was completed. The atlas will provide a geographic and temporal estimation of general water clearness for world coastlines.

b. (U) FY 1985 Program: Developments will continue to improve gravity modeling and measuring devices. These efforts will directly validate gravity models used in DoD advanced weapons systems. Efforts to determine the deflection of the vertical will continue. The second flight of a high altitude balloon with an integrated gravity meter and Global Positioning Satellite (GPS) receiver for measuring high altitude gravity will also occur during the year.

c. (U) FY 1986 Planned Program and Basis for FY 1986 Request: Additional developments are planned to improve gravity models and measuring techniques, including high altitude gravity measurements. Efforts will also continue to determine the deflection of the vertical and other geodetic parameters in support of strategic missile systems.

d. (U) Program to Completion: N/A. This is a continuing program.

e. (U) Milestones: N/A.

UNCLASSIFIED

EXHIBIT PB-33B
(continued)

UNCLASSIFIED

(U) Program Element: #64781B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Engineering Development and Test

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

B1. (U) Program Description -- 6.4D - MC&G Data Processing & Management:

2. (U) Program Accomplishments and Future Efforts:

a. (U) FY 1984 Accomplishments: The major program activities during FY 1984 included:

(1) (U) Further upgrading of the hardware and software for the Remote Work Processing Facilities (RWPF) at DMA Production Centers to more efficiently test and evaluate digital technology for use in DMA's emerging digital production system, including algorithm implementation on the upgraded RWPF, and to develop a training program for techniques and production personnel in exploitation of softcopy source materials and MC&G products.

(2) (U) The implementation of the Rapid Coordinate Transformation Device was initiated. This is a special purpose, programmable micro-processor based device which will perform various projection transformations used in MC&G processing.

(3) (U) The implementation of the Modern Program Environment (MPE) task which will establish a modern software engineering environment within DMA to improve the quality and productivity of computer software development.

(4) (U) The completion of the specification of a standard format for MC&G raster data and software. The Raster Reformatting System will provide software for the interchange of raster data among DMA raster processing systems.

b. (U) FY 1985 Program:

(1) (U) The RWPF upgrade will be accomplished this year, and work will begin on the evaluation of existing hardware and software capabilities for production applications, specifically in the area of semi-automated feature extraction.

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EXHIBIT PB-33B
(continued)

UNCLASSIFIED

(U) Program Element: #647018

(U) Title: Mapping, Charting and Geodesy (MC&G)
Engineering Development and Test

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

(2) (U) The development of the Rapid Coordinate Transformation Device (RCTD) will continue. During this fiscal year the specification for the device will be reduced to design and hardware and software implementation will commence.

(3) (U) The implementation of the Modern Programming Environment (MPE) will continue. The development of the methodology for effective use of the tools will be completed.

(4) (U) The Raster Reformatting System product will be under final system testing. After testing and evaluation is completed, it will be incorporated in the production scenario.

c. (U) FY 1986 Planned Program and Basis for FY 1986 Request:

(1) (U) Efforts on the Remote Work Processing Facility (RWPF) will continue to be directed toward semi-automatic feature extraction strategies. The RWPF will increasingly become the test-bed for the evaluation and development of this and related technologies.

(2) (U) The implementation of the Rapid Coordinate Transformation Device (RCTD) will be completed this year. The engineering model will be tested, delivered and installed at DMA Production Centers.

(3) (U) The pilot Modern Programming Environment (MPE) project will continue. After adequate training for DMA users, an extensive test program will be undertaken to evaluate the adequacy of the tools and methodology in the DMA software life-cycle environment.

d. (U) Program to Completion: This is a continuing program.

e. (U) Milestones: N/A

UNCLASSIFIED

EXHIBIT PB-33B
(continued)

REPRODUCED AT GOVERNMENT EXPENSE

UNCLASSIFIED

(U) Program Element: #64701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Engineering Development and Test

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

C1. (U) Program Description -- 6.4P - MC&G Product Generation

2. (U) Program Accomplishments & Future Efforts:

a. (U) FY 1984 Accomplishments: Significant accomplishments during this year included:

(1) (U) Further development of a Source Assessment System (SAS) which will provide DMA with an automated capability to compare, evaluate and upgrade existing cartographic products and data base materials with multiple sources of data (maps, charts, imagery, digitally formatted data).

(2) (U) Further development of a prototype Carto Compilation/Revision System (CCRS) to significantly improve upon present methods, essentially manual techniques employed in the compilation and revision of aeronautical charts and digital products, e.g., air target materials, navigation and planning charts, TERCOM elevation matrix data.

(3) (U) Development of computer program/software to automatically extract terrain analysis data from LANDSAT imagery.

(4) (U) Further development of components/equipment for an improved Terrain Analysis Production System (TAPS). The end product will provide DMA with a capability to digitally produce and revise terrain analysis data base and derivative products.

b. (U) FY 1985 Program:

(1) (U) The SAS and CCRS will be completed and delivered to DMA Production Centers.

(2) (U) The modification to TAPS will be completed and delivered to a DMA Production Center.

(3) (U) A program will be developed to improve the accuracy of the digital elevation data generated on the Universal Automatic Map Compilation Equipment (UNAMACE).

EXHIBIT PR-338
(continued)

UNCLASSIFIED

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(U) Program Element: #64701B

(U) Title: Mapping, Charting and Geodesy (MC&G)
Engineering Development and Test

(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Budget Activity: Intelligence & Communications #5

c. (U) FY 1986 Planned Program and Basis for FY 1986 Request:

(1) (U) An advanced development effort for the automatic generalization and development of digital data will be completed to support multi-product mapping requirements.

(2) (U) A totally digital Geographic Names Data Base will be completed and delivered to DMA Production Centers.

(3) (U) Improvements for the UNAMACE will continue.

d. (U) Program to Completion: N/A. This is a continuing program.

e. (U) Milestones: N/A.

H. (U) PROJECTS MORE THAN \$7 MILLION IN FY 1986: N/A.

I. (U) TEST AND EVALUATION: N/A.

EXHIBIT PB-33B
(continued)

UNCLASSIFIED

UNCLASSIFIED

FY 1986 RDT&E DESCRIPTIVE SUMMARY

(U) Program Element: #351398
 (U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Title: Exploitation Modernization Program
 (U) Budget Activity: Intelligence & Communications #5

A. (U) RESOURCES: (\$ in Thousands)

		FY 1984 Actual*	FY 1985 Estimate	FY 1986 Estimate	FY 1987 Estimate	Additional to Completion Continuing	Total Estimated Cost N/A
(U)	TOTAL FOR PROGRAM ELEMENT	--	167,385	242,853			
(U)	Exploitation Modernization Program	--	167,385	242,853			

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Exploitation Modernization Program (EMP) effort is providing the Defense Mapping Agency (DMA) with an all-digital production capability. Compared to current capabilities, the all-digital system is expected to increase DMA's production capacity to support current and new weapon systems and tactical operations. The EMP's goals are a 50 percent reduction in pipeline time as compared to current capabilities.

C. (U) COMPARISON WITH FY 1985 DESCRIPTION SUMMARY: This budget request has been the first opportunity to develop costing data using actual contractor input. As a deliverable under Competitive Design Phase (CDP) contracts, each segment bidder was required to submit a preliminary and final Rough Order of Magnitude (ROM) cost estimate. The funding levels contained in this budget request are based on this input and reflect little overall change to previously provided amounts.

D. (U) Other Appropriation Funds:

		FY 1984 Actual*	FY 1985 Estimate	FY 1986 Estimate	FY 1987 Estimate	Additional to Completion Continuing	Total Estimated Cost N/A
(U)	Procurement	--	6,639	18,799			N/A
(U)	Operation & Maintenance	--	14,739	19,488			N/A

*Previously funded under PE 35159B.

EXHIBIT PB-338

UNCLASSIFIED

REPRODUCED AT GOVERNMENT EXPENSE

UNCLASSIFIED

(U) Program Elements: #35139B
(U) USDR&E Mission Area: Geophysical and Space
Support #325 - TIARA

(U) Title: Exploitation Modernization Program
(U) Budget Activity: Intelligence & Communications #5

E. (U) Related Activities: N/A

F. (U) WORK PERFORMED BY: N/A

G. (U) PROJECTS LESS THAN \$10 MILLION IN FY 1986: N/A

H. (U) PROJECTS OVER \$10 MILLION IN FY 1986: Pursuant to a Secretary of Defense decision, the Director, DMA established a DMA Special Program Office for Exploitation Modernization (DMASPOEM) to have principal responsibility for managing the Exploitation Modernization Program (EMP) effort. The program consists of two systems: (1) a MARK 85 system scheduled for Initial Operational Capability (IOC) in 1985, and (2) a MARK 90 system scheduled for IOC in September 1990 and Final Operational Capability (FOC) in 1991.

1. (U) Project Description: Within the MARK 85 and 90 system definitions, work has been allocated to segments. Each are responsible for a separate portion of the overall effort. MARK 85 will handle near-term requirements. The all-digital MARK 90 EMP will consist of six elements:

a. (U) Production Management. Supports resource allocation, work assignment, production monitoring, and quality assurance.

b. (U) Source Preparation. Effects source review, allocation, and selection, digitization and analytic control and development.

c. (U) Data Extraction. Supports extraction of elevation and planimetric data.

d. (U) Product Generation. Supports the generation and revision of MC&G products.

e. (U) Data Management. Provides for centralized management of source materials, extracted feature and elevation data, and formatted/symbolized product data.

f. (U) Communications. Provides direct digital transmission of data between the EMP segments and furnishes a gateway and pathway between DMA Production Centers.

EXHIBIT PB-33B
(continued)

UNCLASSIFIED

Document: #351398
Geophysical and Space
Support #325 - TIARA
Course Mission Area:

UNCLASSIFIED

(U) Title: Exploitation Modernization Program
(U) Budget Activity: Intelligence & Communications #5

E. (U) Related Activities: N/A

F. (U) WORK PERFORMED BY: N/A

G. (U) PROJECTS LESS THAN \$10 MILLION IN FY 1986: N/A

H. (U) PROJECTS OVER \$10 MILLION IN FY 1986: Pursuant to a Secretary of Defense decision, the Director, DMA established a DMA Special Program Office for Exploitation Modernization (DMASPOEM) to have principal responsibility for managing the Exploitation Modernization Program (EMP) effort. The program consists of two systems: (1) a MARK 85 system scheduled for Initial Operational Capability (IOC) in 1985, and (2) a MARK 90 system scheduled for IOC in September 1990 and Final Operational Capability (FOC) in 1991.

1. (U) Project Description: Within the MARK 85 and 90 system definitions, work has been allocated to segments. Each are responsible for a separate portion of the overall effort. MARK 85 will handle near-term requirements. The all-digital MARK 90 EMP will consist of six elements:

a. (U) Production Management. Supports resource allocation, work assignment, production monitoring, and quality assurance.

b. (U) Source Preparation. Effects source review, allocation, and selection, digitization and analytic control and development.

c. (U) Data Extraction. Supports extraction of elevation and planimetric data.

d. (U) Product Generation. Supports the generation and revision of MCEG products.

e. (U) Data Management. Provides for centralized management of source materials, extracted feature and elevation data, and formatted/symbolized product data.

f. (U) Communications. Provides direct digital transmission of data between the EMP segments and furnishes a gateway and pathway between DMA Production Centers.

UNCLASSIFIED

EXHIBIT PB-33B
(continued)

UNCLASSIFIED

(U) Program Elements: 135139B

(U) USDR&E Mission Area: Geophysical and Space
Support 1325 - TIARA

(U) Title: Exploitation Modernization Program

(U) Budget Activity: Intelligence & Communications 65

(U) Each segment is to be coordinated and interfaced into a cohesive system via the efforts of a system integration contract. The overriding contracting strategy for MARK 98 has been to issue two or more Competitive Design Phase (CDP) contracts for each segment. At the conclusion of the CDP, one of the competing contractors will be chosen to proceed with the Design Acquisition Phase (DAP).

2. (U) Program Accomplishments and Future Programs:

a. (U) FY 1984 Accomplishments: During FY 1984, effort continued towards the development of a MARK 85 Initial Operational Capability (IOC). This included the development of the Digital Stereo Comparator/Compiler (DSCC) which is the prototype of the MARK 98 production system. As such, it allows high accuracy measurement of data feature and elevation collection, and editing and reduction of data. For MARK 98, all CDP contracts have been awarded and work on these contracts continues towards the development of DAP proposals. One MARK 98 segment was awarded a DAP contract in September 1984.

b. (U) FY 1985 Program: The DSCC is scheduled for delivery in FY 1985 and MARK 85 will achieve initial operating capability in FY 1985. Also for MARK 98, all remaining DAP contract awards will be made during FY 1985.

c. (U) Program to Completion: See Paragraph H.

d. (U) Milestones: See paragraph H.

e. (U) Explanation of Milestone Changes: N/A

I. (U) Test and Evaluation Data: N/A

UNCLASSIFIED

EXHIBIT PB-33B
(continued)

UNCLASSIFIED

FY 1986 RDT&E DESCRIPTIVE SUMMARY

(U) Program Element: 035159B(U) USDR&E Mission Area: Capabilities Development
0324 - TIARA(U) Title: Defense Reconnaissance Support Activities(U) Budget Activity: Intelligence & Communications 05A. (U) RESOURCES: (\$ in Thousands)

	<u>Title</u>	<u>FY 1984 Actual</u>	<u>FY 1985 Estimate</u>	<u>FY 1986 Estimate</u>	<u>FY 1987 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
(U)	TOTAL FOR PROGRAM ELEMENT	108,939	11,288	9,750		Continuing	N/A
(U)	Acquisition Systems Development	14,964	11,288	9,750			
(U)	Exploitation Modernization Program*	93,975	--	--	--		

*See Program Element 351398, Exploitation Modernization Program, for details.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The description of the funding for this program element is at a higher classification level and contained in the Tactical Intelligence and Related Activities (TIARA), Defense Reconnaissance Support Program (DRSP) Volume VI, Congressional Justification Book.C. (U) Other Appropriation Funds:

		<u>FY 1984 Actual</u>	<u>FY 1985 Estimate</u>	<u>FY 1986 Estimate</u>	<u>FY 1987 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
(U)	Procurement	14,308	--	--	--	N/A	N/A
(U)	Operation & Maintenance	11,558	8,548	8,984		Continuing	N/A

EXHIBIT PB-338

UNCLASSIFIED

UNCLASSIFIED

(U) Program Element: #35159B

(U) USDR&E Mission Area: Capabilities Development
#324 - TIARA

(U) Title: Defense Reconnaissance Support Activities

(U) Budget Activity: Intelligence & Communications \$

D. (U) Related Activities: N/A

E. (U) WORK PERFORMED BY: N/A

F. (U) PROJECTS LESS THAN \$10 MILLION (\$7 MILLION) IN FY 1986: Description of project details can be found under DMA support in the TIARA DRSP, Volume VI, Congressional Justification Book.

G. (U) PROJECTS OVER \$10 MILLION (\$7 MILLION) IN FY 1986: N/A

H. (U) TEST AND EVALUATION DATA: N/A

EXHIBIT PB-338
(continued)

UNCLASSIFIED

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DEFENSE MAPPING AGENCY

PERFORMER DISTRIBUTION
 Research, Development, Test and Evaluation
 (Thousands of Dollars)

Appropriation: RDT&E, Defense Agencies

Date: 06 February 1985

	Total Obligational Authority		
	FY 1984	FY 1985	FY 1986
1. (U) For operation of installations of the reporting DoD Component Government operated . . .			
2. (U) For operation of installations of the reporting DoD Component Contractor operated . . .			
3. (U) For contracts <u>directly in support</u> of work actually performed at installations of the reporting DoD Component			
4. (U) For work assigned to other Department of Defense Activities	129,962	281,515	277,129
5. (U) For work assigned to activities of other Government agencies	--	--	--
6. (U) For work performed by industrial contractors ("profit" organizations)	643	776	738
7. (U) For work performed by educational institutions	834	1,612	773
a. (U) <u>Designated Fed Contract Res Centers</u>	(--)	(--)	(--)
b. (U) <u>Other Institutions</u>	(834)	(1,612)	(773)
8. (U) For work performed by other "non-profit" organizations	175	225	235
a. (U) <u>Designated Fed Contract Res Centers</u>	(175)	(225)	(235)
b. (U) <u>Other Institutions</u>	(--)	(--)	(--)
9. (U) Total RDT&E Appropriation	131,614	284,128	278,867

UNCLASSIFIED

EXHIBIT PB-33D

UNCLASSIFIED

DEFENSE MAPPING AGENCY

PERFORMER DISTRIBUTION
Research, Development, Test and Evaluation
(Thousands of Dollars)

Appropriation: RDT&E, Defense Agencies

Date: 06 February 1985

		Total Obligational Authority		
		FY 1984	FY 1985	FY 1986
1.	(U) For operation of installations of the reporting DoD Component Government operated . . .			
2.	(U) For operation of installations of the reporting DoD Component Contractor operated . . .			
3.	(U) For contracts <u>directly in support</u> of work actually performed at installations of the reporting DoD Component			
4.	(U) For work assigned to other Department of Defense Activities	129,962	281,515	277,129
5.	(U) For work assigned to activities of other Government agencies	--	--	--
6.	(U) For work performed by industrial contractors ("profit" organizations)	643	776	738
7.	(U) For work performed by educational institutions	834	1,612	773
	a. (U) <u>Designated Fed Contract Res Centers</u> . . .	(--)	(--)	(--)
	b. (U) <u>Other Institutions</u>	(834)	(1,612)	(773)
8.	(U) For work performed by other "non-profit" organizations	175	225	235
	a. (U) <u>Designated Fed Contract Res Centers</u> . . .	(175)	(225)	(235)
	b. (U) <u>Other Institutions</u>	(--)	(--)	(--)
9.	(U) Total RDT&E Appropriation	131,614	284,128	278,867

UNCLASSIFIED

EXHIBIT PB-33D

UNCLASSIFIED

FEDERAL CONTRACT RESEARCH CENTERS

SUMMARY BY APPROPRIATION AND PROGRAM ELEMENT
(\$ in Thousands)

	<u>FY 1984 Actual</u>	<u>FY 1985 Estimate</u>	<u>FY 1986 Estimate</u>	<u>FY 1987 Estimate</u>
(U) <u>AEROSPACE CORPORATION</u>				
(U) <u>Research, Development, Test and Evaluation</u>				
(U) 6.37.01.B Mapping, Charting and Geodesy Investigations and Prototype Development	175	225	235	235
(U) TOTAL RDT&E	175	225	235	235
(U) REMARKS: For investigations, tests, and analysis of advanced positioning techniques in support of national level programs.				
(U) TOTAL AEROSPACE CORPORATION	175	225	235	235
(U) <u>TOTAL PROGRAM SUMMARY BY APPROPRIATIONS</u>				
(U) Research, Development, Test and Evaluation . . .	175	225	235	235
(U) Operation and Maintenance	--	--	--	--
(U) Total Federal Contract Research Centers (In-house effort)	175	225	235	235
(U) Subcontract Effort Excluded from this Amount . .	--	--	--	--

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EXHIBIT PB-338